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The Influence of Organization Culture on Aviation Safety – A Case Study of a United States Navy FA-18 Landing Mishap

Peter J. Kind
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Peter J. Kind entitled "The Influence of Organization Culture on Aviation Safety – A Case Study of a United States Navy FA-18 Landing Mishap." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Aviation Systems.

Ralph D. Kimberlin, Major Professor

We have read this thesis and recommend its acceptance:

Richard J. Ranaudo, Charles T. N. Raludan

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Anne Mayhew
Vice Chancellor and Dean of Graduate Studies

(Original signatures are on file with official student records.)

THE INFLUENCE OF ORGANIZATION CULTURE ON AVIATION SAFETY – A CASE STUDY OF A UNITED STATES NAVY FA-18 LANDING MISHAP

A Thesis
Presented for the
Master of Science
Degree
The University of Tennessee, Knoxville

Peter J. Kind
August 2004

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to all those who helped me complete my Master of Science degree in Aviation Systems. I would like to thanks Dr. Kimberlin for his guidance and encouragement throughout this thesis effort. I would like to thank Ms. Betsy Harbin for her great help and patience in assisting me with any problem encountered. I would like to thank numerous people at the Naval Safety Center for providing me statistical data used in this thesis.

Lastly, I would like to thank my wonderful wife and family, whose support and encouragement made this work possible.

ABSTRACT

Aviation safety has improved dramatically in the last 50 years as evidenced by declining mishap rates. Improvements in aviation safety have come about primarily through work on two fronts; mechanical improvements (aircraft and its support systems) and human improvements (human interface, training and process interaction). Safety improvements on the hardware side of aviation have come relatively quickly and continuously, paralleling advances in engineering and science. Today’s aircraft have become extremely reliable machines with redundancy built into every system.

Unfortunately, while the overall aviation mishap rate has declined, the percentage of accidents attributed to “human error” has steadily increased. Strides in the human or software side of aviation safety have not kept pace with the mechanical or hardware advances. Most think of “human error” in terms of the individual, be it pilot, controller, or mechanic. A less obvious aspect is the organizational responsibility to aviation safety. Why is one airline or squadron able to maintain a perfect safety record with the same machines and personnel available to other less successful organizations?

This thesis will examine a Judge Advocate General (JAG) Investigation (written and conducted by the author) of a Landing Mishap involving a Navy FA-18 Hornet. The mishap is significant because a key causal factor was poor organizational climate. The analysis of real-world mistakes and lessons learned in a “high risk” organization will aid in identifying the warning signs of a failing organization and assist in producing some practical solutions towards improving the safety of any aviation organization.

PREFACE

The Command Investigation of the FA-18 Aircraft Accident contained within this thesis was obtained from the Judge Advocate General, Commander, Naval Air Forces through the Freedom of Information Act. The naval mishap statistics used were obtained from the Naval Safety Center database. The analysis, opinions, conclusions, and recommendations expressed herein are those of the author and do not represent the official position of the Commander, Naval Air Forces, the Naval Safety Center, or the United States Department of the Navy. The author's recommendations should not be considered attributable to any of the aforementioned authorities or for any purposes other than the fulfillment of the thesis requirement.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACLS	Automatic Carrier Landing System
AFB	Air Force Base
AGL	Above Ground Level
ALS	Approach Lighting System
AMB	Aircraft Mishap Board
AOM	All Officer Meeting
ASR	Airport Surveillance Radar
ATC	Air Traffic Control
ATCFO	Air Traffic Control Facilities Officer
BFM	Basic Fighter Maneuvers
CAG	Commander Air Group (Wing)
CAPT	Navy Captain (O-6)
CATM	Captive-carry Air Training Missile
CDR	Navy Commander (O-5)
CI	Command Investigation
CO	Commanding Officer
CODR	Conventional Ordnance Deficiency Report
COMPTUEX	Composite Training Unit Exercise
CNAP	Commander Naval Air Forces Pacific
CQ	Carrier Qualification
CSFWP	Commander Strike Fighter Wing Pacific

CVW	Carrier Air Wing
DA	Decision Altitude
DCAG	Deputy Commander Air Group (Wing)
DH	Decision Height
DOD	Department of Defense
FAA	Federal Aviation Administration
FAA INST	Federal Aviation Administration Instruction
FCLP	Field Carrier Landing Practice
FLIP	Flight Information Publication
FOF	Finding of Fact
FOIA	Freedom of Information Act
GCA	Ground Controlled Approach
GMT	Greenwich Mean Time
GPA	Grade Point Average
HAZREP	Hazard Report
HFACS	Human Factors Analysis and Classification System
HIRL	High Intensity Runway Lighting
ICLS	Instrument Carrier Landing System
IDTC	Inter-Deployment Turnaround Cycle
IO	Investigating Officer
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions

IMER	Integrated Multiple Ejector Rack
JAG	Judge Advocate General
JTFEX	Joint Task Force Exercise
LATR	Large Area Tracking Range
LCDR	Navy Lieutenant Commander (O-4)
LSO	Landing Signal Officer
LT	Navy Lieutenant (O-3)
LTJG	Navy Lieutenant Junior Grade (O-2)
MA	Mishap Aircraft
MDA	Minimum Descent Altitude
MF	Mishap Flight
MLG	Main Landing Gear
MP	Mishap Pilot
MSG	Message (Naval)
NADEP	Naval Air Depot
NAF	Naval Air Field
NAMP	Naval Aviation Maintenance Program
NAS	Naval Air Station
NASLEMINST	Naval Air Station Lemoore Instruction
NATOPS	Naval Air Training and Operating Procedures Standardization
NAWS	Naval Air Weapons Station
NOTAMS	Notice to Airmen

ODO	Operations Duty Officer
OPNAVINST	Chief of Naval Operations Instruction
OPS O	Operations Officer
ORM	Operational Risk Management
PAR	Precision Approach Radar
PERSTEMPO	Personnel Tempo
RAG	Replacement Air Group
REIL	Runway End Identifier Lights
RVR	Runway Visual Range
SDO	Squadron Duty Officer
SFARP	Strike Fighter Advanced Readiness Program
SFWSP	Strike Fighter Weapons School Pacific
SFWT	Strike Fighter Weapons Training
SFWTI	Strike Fighter Weapons Training Instructor
SLATS	Strike Leader Attack Training Syllabus
SOP	Standard Operating Procedures
SORM	Standard Organization Regulations Manual
TACAN	Tactical Air Navigation
VFA	Navy Strike Fighter squadron
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
WSCO	Weapons School Commanding Officer
XO	Executive Officer

CHAPTER 1

INTRODUCTION

BACKGROUND

In high hazard organizations, where the risk of error may involve dire consequences, leaders aggressively strive for safe, reliable performance. Within Naval Aviation, significant strides have been made in reducing aircraft mishaps over the last fifty years. Improvements such as the angling of aircraft carrier flight decks, establishment of the Navy Aviation Safety Center, and creation of the Naval Aviation Maintenance Program (NAMP) were early efforts established to mitigate risk and reduce mishaps. These early programs were very successful in reducing aircraft accidents as shown in figure 1. They focused primarily on mechanical safety improvements, as this was the primary cause of most early aircraft mishaps.

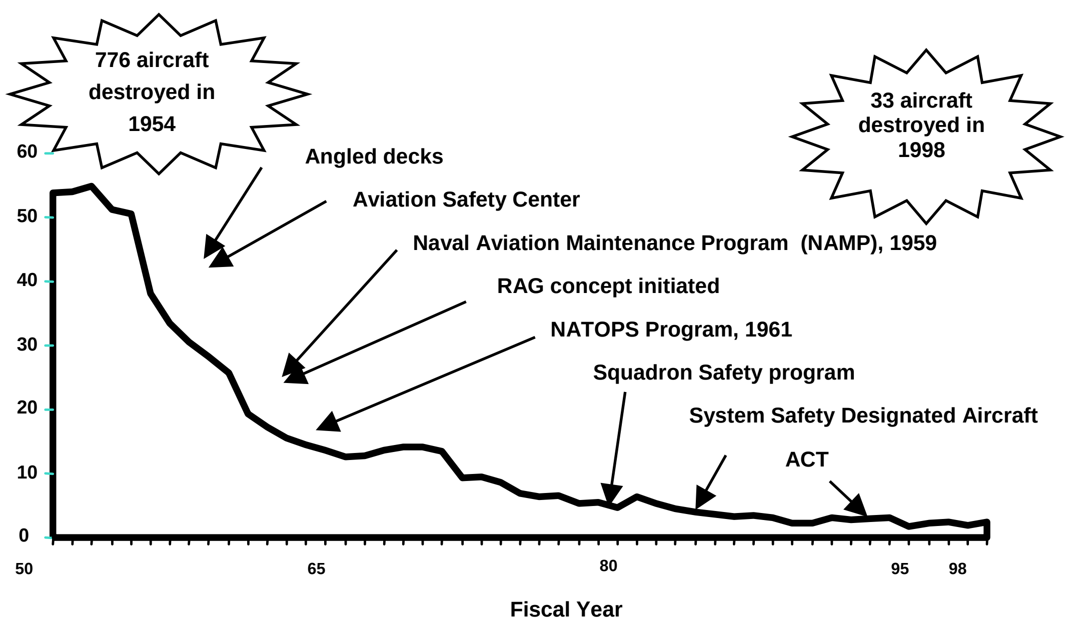

Figure 1. Decline in Naval Aircraft Mishap Rate FY50-98 (Naval Safety Center)

Follow-on improvements continued this trend in mishap reduction. Creation of Replacement Air Groups (RAG's) enabled naval aviators to receive platform specific training prior to being assigned to their fleet squadron. This combined with the Naval Air Training and Operating Procedures Standardization (NATOPS) program enabled new pilots to receive standardized training from experienced instructors in a safe environment, a revolutionary departure from past training methods. Follow-on efforts such as the establishment of Squadron Safety Programs and System Safety Designated Aircraft also played a significant role.

By the early 1990's a disturbing trend was noticed. While errors attributable to mechanical causes had continued to decline to almost zero, human errors did not decline at nearly the same rate. They had actually begun to increase in 1989 as shown in figure 2. It became clear, as human error became the primary causal factor in most naval mishaps, that a shift in focus was required. The Naval Safety Center responded by

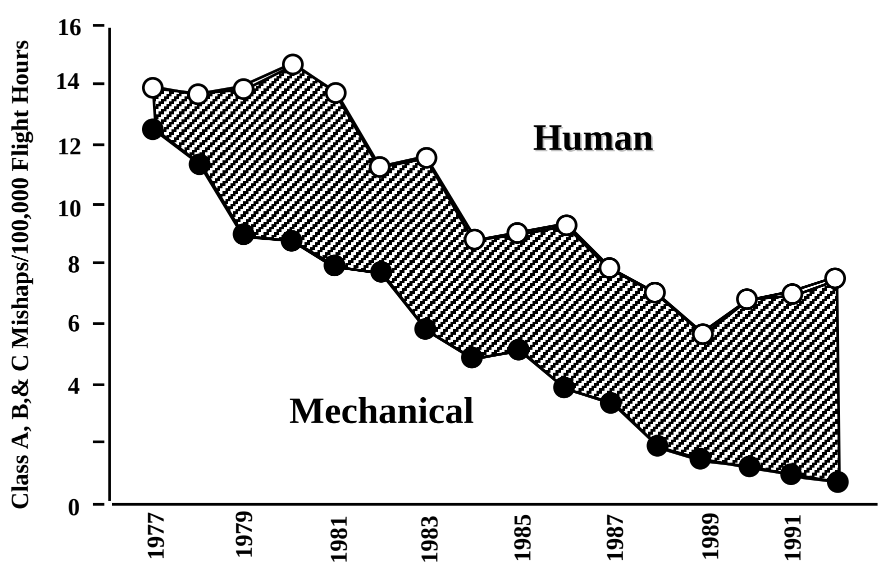

Figure 2. All Navy-Marine Corps Mishaps 1977-1992 (Naval Safety Center)

developing tools such as the Aircrew Coordination Training program and online squadron safety surveys. While these efforts were steps in the right direction, they were little more than stopgap fixes. To achieve significant reduction in human error as a causal factor, an applicable model of human behavior was required. With an accurate model, significant steps could be taken to mitigate the risk of human failure and improve safety. The Naval Safety Center created this model in their Human Factors Analysis and Classification System (HFACS) based on James Reason's Swiss cheese model of human error.

SCOPE

This thesis will use an actual aircraft accident to test the accuracy of the Navy's HFACS model. The mishap was a United States Navy FA-18 Hornet landing accident at NAS Lemoore, CA. The aircraft was fully functional at the time of mishap and there were no casual factors attributed to mechanical malfunction, making it an ideal candidate for the study of human failure. After reviewing the official investigation, analysis, and conclusions, the landing mishap will be subjected to the Navy's HFACS model, a modernized version of the domino theory, to identify the active and latent failures that contributed to the mishap. The analysis will identify shortcomings in the HFAC model (it did not prevent this mishap) and discuss some the possible warning signs of failing organizations. Finally and most importantly, it will provide some practical solutions towards improving the safety of any high-risk organization.

CHAPTER 2

FA-18 LANDING MISHAP INVESTIGATION

INTRODUCTION

This chapter is the Command Investigation of the Class A aircraft accident that occurred at Naval Air Station Lemoore, California on 06 January 2003. It was officially requested and released through the Freedom of Information Act (FOIA). Per the FOIA, all names and personal information regarding the mishap pilot and individual witnesses has been removed (blacked out). No changes were made to the investigation report other than formatting and font adjustments to ensure it remains an accurate representation. The Manual of the Judge Advocate General (JAG) requires copies of all reference material be included as part of the formal mishap report. While the FOIA provided copies of this material, it will not be included in this thesis for size consideration. The information is referenced as enclosures within the formal report and can be assumed verified by the Navy Investigation process.

All the work involved with this command investigation including, research, interviews, finding of facts, conclusions, and report generation, was my own. Although the style is somewhat legalistic, the salient points are easily comprehended and provide an outstanding real-world backdrop for organizational safety culture and its importance to risk and mishap reduction efforts.

MISHAP INVESTIGATION REPORT

21 Feb 03

From: CDR Peter J. Kind, USN, 391-48-4475/1310

To: Commander, Carrier Air Wing Eleven

Subj: COMMAND INVESTIGATION OF THE CLASS A AIRCRAFT ACCIDENT THAT OCCURRED AT NAS LEMOORE (NASL) ON 06 JANUARY 2003

Ref: (a) Manual of the Judge Advocate General (JAGMAN)

Encl: (1) CVW-11 ltr 5830 of 23 Jan 03

(2) Copy of ILS discrepancy an acft 304

(3) Copy of notes from 25/26 Jan 03 interviews with LT [redacted] (VFA-97)

(4) Copy of VFA-97 Flight Schedule of 06 Jan 03

(5) Copy of notes from 26 Jan 03 interview with CDR [redacted] (VFA-97 Commanding Officer)

(6) Copy of notes from 25 Jan 03 interview with LCDR [redacted] (VFA-97)

(7) Copy of NATOPS Landing Signal Officer Manual pages 3-1,3-2

(8) Copy of MP Clearance Notice (Aero medical)

(9) Copy of MP NATOPS Evaluation Report

(10) Copy of MP Instrument Rating Request

(11) Copy of MP Physiology/Survival Training

(12) Copy of MP Ejection Seat Training

(13) Copy of MP Orders to VFA-97

(14) Copy of MP VFA-125 Training Jacket Summary

(15) Copy of VFA-125 Pilot Performance Summary for Class FY02-02

(16) Copy of notes from 25 Jan 03 interview with LCDR [redacted] (VFA-97)

(17) Copy of MP Landing Performance Summary for CVW-11 (Includes CAG

LSO Comments)

(18) Copy of VFA-97 Standard Operating Procedures (SOP)

(19) Copy of notes from 26 Jan 03 interview with LT [redacted] (CVW-11 Flight Surgeon)

(20) Copy of CVW-11 Landing Signal Officer Qualification Letter

(21) Copy of notes from 25/26 Jan 03 interviews with LT [redacted] (VFA-97)

(22) Copy of notes from 25 Jan 03 interview with LTJG [redacted] (VFA-97)

(23) Copy of notes from 25 Jan 03 interview with LT [redacted] (VFA-97)

(24) Copy of notes from 25 Jan 03 interview with LCDR [redacted] (VFA-97)

(25) DOD Standard Instrument Departures Packet

(26) DOD FLIP High Altitude Approach Chart pg XXXI

(27) DOD FLIP IFR – Supplement pg B-361/2, A2/3/10

(28) Copy of notes from 12 Feb 03 interview with LTJG [redacted] (Air Traffic Control Facility Officer)

(29) Copy of NAS Lemoore Airfield NOTAMs for 06 Jan 03

(30) Copy of notes from 25 Jan 03 interview with LT [redacted] (VFA-97)

(31) NATOPS General Flight and Operating Instruction 3710.7 pg 3-11, 4-2

(32) VFA-97 Shore Admin Brief Guide

(33) Copy of notes from 26 Jan 03, 02 Feb 03, and 16 Feb 03 interviews with CAPT [redacted] (Commander, Carrier Air Wing Eleven)

(34) Copy of notes from 26 Jan 03 interview with LCDR [redacted] (VFA-97)

(35) Copy of notes from 25/26 Jan 03 interviews with LT [redacted] and LT [redacted] (CVW-11 Landing Signal Officers)

(36) Lemoore Metro 06 Jan 03 Surface Observation Request

(37) Audio-tape Transcripts of Tower/Approach/Departure and Final Controller for Mishap Event

(38) NAS Lemoore Instruction 3710.1M pg III-11/12

(39) FAA Instruction 7110.65N pg 3-4-1/2/3/4

(40) Copy of notes from 12 Feb 03 interview with AC1 [redacted] (NAS Lemoore Tower Supervisor)

(41) NATOPS General Flight and Operating Instructions 3710.7S pg 5-19, 5-20

(42) Copy of written statement by LT [redacted]

(43) Copy of notes from 26 Jan 03 interview with LT [redacted] (VFA-97)

(44) Copy of notes from 26 Jan 03 interview with CAPT [redacted] (Commander, Strike-Fighter Wing Pacific)

(45) Copy of notes from 26 Jan 03 interview with CDR [redacted] (VFA-97 Executive Officer)

(46) VFA-97 SFWT Qualification Sheet

(47) NATOPS General Flight and Operating Instructions 3710.7S pg 8-6, 8-7

(48) COMNAVAIRPAC ORM MSG DTG 191006ZJUL01

(49) CVW-11 Safety Incident Summary

(50) Copy of notes from 12 Feb 03 interview with [redacted] (NAS Lemoore Weather Forecaster).

(51) Copy of notes from 05 Feb 03 interview with CDR [redacted] (SFWSP Commanding Officer)

(52) VFA-97 Maintenance Work Schedule (24 Nov – 25 Jan)

(53) Damage and Costs Email from VFA-97 Maintenance

(54) CNAP Mishap Rates FY01-Present

Preliminary Statement

1. As directed by Enclosure (1) and in accordance with reference (a), a one-officer Command Investigation (CI) not requiring a hearing, was conducted to investigate the cause, resulting damages, and the responsibility for a landing mishap of a single FA-18A aircraft that happened on 06 January 2003. The mishap occurred on Runway 32R at Naval Air Station Lemoore, CA, while conducting night Field Carrier Landing Practice (FCLP). The Mishap occurred as the pilot was flying final landing after the FCLP mission was canceled for deteriorating weather. Aircraft salvage was conducted and all recoverable parts have been obtained. There was no civilian personnel or property damage, destruction or loss. There has been no environmental impact reported as a result

of this mishap. No claims against the government have been made, and none are anticipated. This investigation reports the Findings of Fact, Opinions, and Recommendations regarding the circumstances surrounding the aircraft accident.

2. This mishap meets the statutory requirements for a single member investigation stated in section 0242c(2) of reference (a). I meet the statutory requirements as an investigator for a single member investigation stated in section 0242c(2) of reference (a). I am a Commander in the United States Navy. I have 12 years experience flying FA-18 aircraft and have served as a Carrier Air Wing Operations Officer, Fleet Replacement Squadron Training Officer, and Operations, Maintenance, Safety Officer in an operational FA-18C squadron. Additionally, I am a graduate of the United States Navy Safety Officer Course and Operational Risk Management (ORM) course.

3. All reasonable relevant evidence was collected and analyzed. The directives of the convening authority established in enclosure (1) have been met. There were no difficulties encountered during the conduct of this investigation.

4. The style of this report is written so that a non-aviator can readily understand it. Some familiarity with naval organization, operations, terminology and culture is assumed. Specific aviator acronyms are expanded, and to the maximum extent possible aviation specific terminology is explained.

5. All witnesses were advised of the differences between the Aircraft Mishap Board (AMB) investigation and this CI. All individuals interviewed provided complete cooperation and as far as the Investigating Officer (IO) is concerned, all relevant facts are known.

6. Original photographs are being maintained with the Naval Safety Center, Norfolk, VA, DSN [redacted].

7. Pilot qualification records and flight logbook are being maintained with the VFA-97 Operation Department, NAS Lemoore, CA, phone number [redacted].

8. The aircraft and logbook are located at NADEP Test Line, Building 785, NAS North Island, CA, phone number [redacted].

9. Original enclosures are maintained by VFA-122 Legal Department, Hangar Five, NAS Lemoore, CA. Point of contact: VFA-122 Legal Officer, LTJG [redacted], [redacted].

10. To assist the reader in understanding the findings of this report, the following abbreviations and definition of terms are provided.

a. Minimum Decision Altitude (MDA). The lowest altitude, expressed in feet above mean sea level, to which descent is authorized on final approach or during circle-to-land maneuvering in execution of a standard instrument approach where no electronic glide slope is provided.

b. Decision Altitude/Height (DA/DH). A specified altitude or height in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Decision Altitude (DA) is referenced to Mean Sea Level (MSL) and Decision Height (DH) is referenced to the threshold elevation.

The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path.

c. Ground Controlled Approach (GCA). A radar approach system operated from the ground by air traffic control personnel transmitting instructions to the pilot by radio.

The approach may be conducted with surveillance radar (ASR) only or with both surveillance and precision approach radar (PAR).

d. Precision Approach Radar (PAR). Radar equipment in some ATC facilities operated by the FAA and/or military services at joint-use civil/military locations and separate military installations to detect and display azimuth, elevation, and range of aircraft on the final approach course to a runway. This equipment may be used to monitor certain non-radar approaches, but it is primarily used to conduct a precision instrument approach (PAR) wherein the controller issues guidance instructions to the pilot based on the aircraft's position in relation to the final approach course (azimuth), the glide path (elevation), and the distance (range) from the touchdown point on the runway as displayed on the radar scope.

e. Airport Surveillance Radar (ASR). Approach control radar used to detect and display an aircraft's position in the terminal area. ASR provides range and azimuth information but does not provide elevation data. Coverage of the ASR can extend up 60 NM.

f. Surveillance Approach. An instrument approach wherein the air traffic controller issues instructions, for pilot's compliance, based on aircraft position in relation to the final approach course (azimuth), and the distance (range) from the end of the runway as displayed on the controller's radar scope. The controller will provide recommended altitudes on final approach if requested by the pilot.

g. Non-precision Approach. A standard instrument approach in which no electronic glide slope is provided; e.g., TACAN and ASR approaches.

h. Precision Approach. A standard instrument approach in which an electronic glide slope/glide path is provided; e.g., PAR and ILS.

i. Non-radar Approach. Used to describe instrument approaches for which course guidance on final approach is not provided by ground-based precision or surveillance radar.

j. Tactical Air Navigation (TACAN). An ultra-high frequency electronic rho-theta air navigation aid, which provides suitably equipped aircraft a continuous indication of bearing and distance to the selected TACAN station.

k. Automatic Carrier Landing System (ACLS). United States Navy final approach equipment consisting of precision tracking radar coupled to a computer data link to provide continuous information to the aircraft, monitoring capability to the pilot, and a precision approach system. ACLS allows the pilot to “couple up”, flying a hands-off approach all the way to touchdown.

l. Approach Light System (ALS). An airport lighting facility which provides guidance to landing aircraft by radiating light beams in a directional pattern by which the pilot aligns the aircraft with the extended centerline of the runway on his/her final approach for landing.

m. Final Controller. The controller providing information and final approach guidance during PAR and ASR approaches utilizing radar equipment.

n. Runway Lights/Runway Edge Lights. Lights having a prescribed angle of emission used to define the lateral limits of a runway. Runway lights are uniformly spaced at intervals of approximately 200 feet, and the intensity may be preset or controlled.

o. Touchdown Zone Lighting. Two rows of transverse light bars located symmetrically about the runway centerline normally at 100 foot intervals. The basic system extends 3000 feet along the runway.

p. Runway Centerline Lighting. Flush centerline lights spaced at 50-foot intervals beginning 75 feet from the landing threshold and extending to within 75 feet of the opposite end of the runway.

q. Threshold Lights. Fixed green lights arranged symmetrically left and right of the runway centerline, identifying the runway threshold.

r. Runway End Identifier Lights (REIL). Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

s. Instrument Meteorological Conditions (IMC). Metrological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.

t. Visual Meteorological Conditions (VMC). Metrological conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than the minima specified for visual meteorological conditions

u. Tower. A terminal facility that uses air/ground communications, visual signaling, and other devices to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the Class D airspace area regardless of flight plan or weather conditions.

v. Approach Control Service. Air traffic control service provided by an approach control facility for arriving and departing VFR/IFR aircraft and, on occasion, en route aircraft.

w. Tule Fog. A radiation fog most commonly occurring from December through February in California's Central Valley. This fog normally develops from the ground up and typically forms as the ground cools off at night and radiates heat into space. In the vicinity of NAS Lemoore, Tule fog will begin forming over the farmlands and the wind can advect this fog over the runways very quickly. This can happen in five minutes or less. Horizontal visibility can be reduced to only a few feet, making driving extremely dangerous.

x. Operational Risk Management (ORM). A decision making tool used by people at all levels to increase operational effectiveness by anticipating hazards and reducing the potential for loss. The purpose of ORM is to minimize risks to acceptable levels, proportional to mission accomplishment. The goal of ORM is to manage risk so the mission can be accomplished with the minimum amount of loss.

11. The findings of fact are divided into areas of interests as follows:

I. Background (Aircraft)
II. Background (Flight Schedule)
III. Background (Mishap Pilot)
IV. Background (Landing Signal Officer (LSO))
V. Background (Other Pilots / SDO)
VI. Background (NAS Lemoore / Reeves Field)
VII. Background (Tower / Approach Controllers)
VIII. Flight Brief
IX. Sequence of Events
X. Command Climate
XI. Risk Mitigation
XII. Damages and Costs

Findings of Fact

I. Background (Aircraft)

1. The mishap aircraft's (MA) Instrument Landing System (ILS) was inoperative at the time of the mishap. (Enclosure 2)

2. Mishap Pilot (MP) stated that except for the ILS, the aircraft was operating normally at time of mishap. (Enclosure 3)

3. Investigating Officer conducted a thorough review of MA logbook and all discrepancies. Nothing was found to indicate a maintenance causal or contributing factor in this mishap.

II. Background (Flight Schedule)

4. The mishap flight (MF) was a scheduled sortie to be flown on 06 JAN 03 with a 2045L brief / 2215L take-off / 2315L land time. The mission was night Field Carrier Landing Practice (FCLP). (Enclosure 4)

5. The Squadron Duty Officer (SDO) smooth copy of the flight schedule for 06 JAN 03 was not signed by VFA-97's Commanding Officer. (Enclosure 4)

6. VFA-97 Commanding Officer (CO) stated he either signed or verbally approved the flight schedule for 06 JAN 2003. (Enclosure 5)

7. VFA-97 flight schedule for 06 JAN 2003 had multiple changes made the day of execution. (Enclosure 4)

8. VFA-97 CO stated the number of schedule changes for 06 JAN 03 was greater than normal. He stated that he approved each flight schedule change and was not uncomfortable with the number of changes. (Enclosure 5)

9. The MF was originally scheduled for six pilots. Only four "up" aircraft were available to execute the mission. As a result, only four pilots flew the FCLP mission. (Enclosure 4)

10. The assigned Mission Commander for the mishap event was one of the pilots cancelled for lack of aircraft. (Enclosure 4)

11. No new Mission Commander was identified by SDO or VFA-97 CO. CO stated that the senior member in the flight would normally be the Mission Commander. (Enclosure 5)

12. The senior pilot in the mishap flight was not on the original flight schedule. He was notified one hour prior to brief that he was a "write-in" for the mishap event. He was not informed that he was the senior pilot in the flight or the Mission Commander. He did not attend the brief and was not aware of his Mission Commander responsibilities until the flight walked for their aircraft. (Enclosure 6)

13. LSO NATOPS states the requirement for night FCLP with more than two aircraft in the pattern is one LSO and one person to assist the controlling LSO. (Enclosure 7)

14. VFA-97 flight schedule only had one LSO scheduled to wave the mishap FCLP period with no one scheduled to assist. VFA-97 CO stated he was not aware of the requirement for two people. (Enclosures 4,5)

III. Background (Mishap Pilot)

15. The MP had a current medical clearance, NATOPS check, instrument check, ejection seat and swim/phys qualifications. (Enclosures 8,9,10,11,12)

16. The MP was a first fleet tour active duty line officer, with designator 1315 (pilot), executing orders assigned to VFA-97. (Enclosure 13)

17. MP completed FA-18 flight training on 24 JUN 02 at VFA-125 in Lemoore, CA. Her overall grades were [redacted]. MP's overall GPA was [redacted] out of 98 pilots graduating in FY01-02. (Enclosures 14,15)

18. MP's VFA-125 Student Grade Summary sheet shows four flights graded as [redacted]. However, documentation could only be found on two of the four flights. The first flight was a FAM-105 (First Solo). A VFA-125 instructor pilot observed MP entering the overhead at NAS Lemoore at [redacted] and graded the flight [redacted]. The second flight was an SRA-133 (Radar Intercepts). MP [redacted] while flying in combat spread and [redacted] with the lead aircraft. (Enclosure 14)

19. A VFA-125 Training Officer Review of MP's progress during training indicates MP [redacted] and [redacted] MP stated to Training Officer that her performance [redacted]. VFA-125 limited her to one flight a day for the remainder of her training. (Enclosure 14)

20. VFA-97 Operations Officer characterized MP pilot's performance in VFA-97 as [redacted], but nothing unsafe. MP was noted as having a good positive attitude. (Enclosure 16)

21. MP landing GPA in CVW-11 was [redacted] and her boarding rate was [redacted] based on 49 passes flown in VFA-97. CVW-11 LSO's stated MP had a slightly [redacted] and a [redacted]. (Enclosure 17)

22. MP stated that VFA-97 officers were allowed one five-day leave period taken at Thanksgiving or one of the two Christmas leave periods. MP chose leave over Thanksgiving and as a result did not take Christmas leave. (Enclosures 3,5)

23. MP worked some portion of everyday between Thanksgiving and the mishap flight (37 days) except for two Sundays (December 8th/22th), two days at Christmas (25th/26th), and two days at New Years (1st/2nd). (Enclosure 3)

24. MP came into work Saturday 04 JAN 03 from 1000-2000L and Sunday 05 JAN 03 from 1400-2000L. Squadron Maintenance Department was working that weekend. (Enclosure 3)

25. VFA-97 Standard Operating Procedures (SOP) states that pilot crew day shall not exceed 14 hours. The "crew day clock" commences with the first (or one hour prior to flight brief) scheduled event and ends with the last land time or end of the last flight-related event. (Enclosure 18)

26. On the day of the mishap (06 JAN 03), the MP was scheduled as follows (Enclosure 4):

1100-1200	Carrier Qualification (CQ) Simulator
1530-1630	NATOPS Check Simulator
1830-1930	CQ Lecture
2045-2315	Night FCLP

27. On the day of the mishap, MP stated she woke and made some phone calls from home at 0800L to reserve some range time for a flight later in the day. MP came into work at 1030L. (Enclosure 3)

28. CVW-11's Flight Surgeon confirmed MP's post-mishap toxicology report was all negative. (Enclosure 19)

IV. Background (LSO)

29. The LSO that waved the MF was a first tour pilot fully qualified to conduct FCLP operations at the field. (Enclosure 20)

30. LSO stated that the two days prior to the mishap, he was in the process of packing and moving his personal goods in preparation for their possible short-notice deployment. He also stated that his car was broken into two days prior to the MF and he was working issues related to that as well. (Enclosure 21)

31. LSO stated he was informed Friday afternoon he was added on the flight schedule to fly his Strike Fighter Weapons and Tactics (SFWT) Level III Check Flight on Monday (day of MF). He stayed at work on Sunday until 2230L planning for the flight. (Enclosure 21)

32. LSO's first scheduled event on the day of the mishap was a 1200L brief for his SFWT Level III Check Flight. His last scheduled event was LSO duties for the final FCLP period ending at 0100L. He stated he came into work at 1015L on the day of the mishap. (Enclosures 4,21)

33. LSO stated his Level III Check Flight was evaluated as an incomplete/re-fly. He was told in the debrief that he most likely would have failed the flight had it been completed. (Enclosure 21)

34. LSO stated he waved the mishap FCLP period per the flight schedule. The follow-on period was cancelled for weather. (Enclosure 16,21)

V. Background (Other FCLP Pilots/ODO)

35. ODO on the day of the mishap was fully qualified in accordance with VFA-97 SORM. He stated that he was familiar with all relevant publications and instructions and had stood two prior duties while under instruction. He stated the first time he had stood duty by himself was on the day of the mishap. (Enclosure 22)

36. VFA-97 CO was not aware that the ODO on the night of the mishap was standing his first unassisted duty. (Enclosure 5)

37. ODO stated that he was added to the flight schedule the day of the mishap to fly an FCLP flight. Another officer covered his ODO duties while he was flying. After completing his flight, he again assumed duties as ODO. He stated that the brief for the MF had already started when he took over. (Enclosure 22)

38. VFA-97 SOP states that the ODO shall ensure the safety of flight operations. The ODO shall monitor field status and weather and advise when conditions may affect operations. (Enclosure 18)

39. ODO was not aware of weather or status of divert field prior to brief or walk time for mishap flight. (Enclosure 22)

40. Table 1 provides the pilots and aircraft in the mishap event (Enclosures 3,6,23,24).

Table 1: Mishap Event Pilots and Aircraft

Aircraft 304	Mishap Pilot
Aircraft 305	Senior LT
Aircraft 313	LCDR (First FA-18 tour)
Aircraft 307	LCDR (Senior pilot)

VI. Background (NAS Lemoore/Reeves Field)

41. NAS Lemoore has offset parallel runways (32L/R and 14L/R) with rough dimensions of 13500' length and 200' wide. (Enclosure 25)

42. The primary instrument runway at NAS Lemoore is 32L. It has Runway Edge Lights, Touchdown Zone Lighting, Runway Centerline Lighting, Carrier Box Lighting, Threshold Lights, and Approach Light System (ALS). (Enclosures 26,27)

43. Runway 32R does not have Carrier Box Lighting, Runway Centerline Lighting or Approach Light System (ALS). (Enclosure 27)

44. All runway lighting was functional at the time of the mishap. (Enclosure 28)

45. Published approaches (and weather minimums) available to FA-18 (single pilot absolute DH minimums are 200'AGL and weather 200-1/2) aircraft on runway 32L/R at NAS Lemoore (elevation 234 feet) are outlined in table 2 (Enclosure 26).

Table 2: Published Approaches Available at Time of Mishap

Runway	Approach	MDA/DH	Weather Minimums
32L	TACAN/ASR	540' (MDA)	400-3/4*
32L	ICLS(ILS)	533' (DH)	300-3/4*
32L	PAR	433' (DH)	200-1/2
32L	ACLS(PALS)	433' (DH)	200-1/2
32R	ASR	620' (MDA)	400-1
32R	PAR	428' (DH)	200-1/2
* When ALS inoperative increase visibility by ¼ mile.			

46. Air Traffic Control Facilities Officer (ATCFO) stated that on the night of the mishap, the ACLS and PAR approaches were not available on runway 32L. The 32L PAR was down for an antenna, and the ACLS was down for data link. The PAR was NOTAM'ed down and the ACLS was not. (Enclosures 28,29)

47. ATCFO stated reliability of NAS Lemoore ACLS system based on quarterly messages as displayed in table 3.

48. ATCFO stated that the NAS Lemoore ACLS system is old and under funded relative to the rest of the Navy's ACLS systems. He stated this contributed to the poor reliability. (Enclosure 28)

49. ATCFO stated that runway visual range (RVR) was the best method for determining airfield visibility since it is located at the end of the runway. NAS Lemoore had equipment to determine RVR on 32L and 32R, but the equipment on 32R was cannibalized to support the system on 32L. On the night of the mishap, both systems were down. ATCFO stated the RVR systems did not receive optimal support. (Enclosure 28)

Table 3: NAS Lemoore ACLS Reliability by Quarter

Quarter	Channel A	Channel B
4QTR02	31%	40%
3QTR02	0%	80%
2QTR02	5%	90%
1QTR02	20%	25%

Note: Fog season in Lemoore is during 4QTR and 1QTR.
(Enclosure 28)

VII. Background (Tower Controllers)

50. ATCFO stated all tower controllers were fully qualified on the night of the MF. (Enclosure 28)

VIII. Flight Brief

51. VFA-97 SOP states that flight briefs will normally begin two hours prior to launch. VFA-97 CO stated that they normally schedule FCLP briefs 1.5 hours prior to launch. (Enclosures 5, 18)

52. MF brief was scheduled 1.5 hours prior to launch and began at on time at 2045L. (Enclosures 4,21)

53. OPNAVINST 3710.7S (General Flight and Operating Instructions) states that the Mission Commander shall be responsible for all phases of the assigned mission except those aspects of safety of flight that are related to the physical control of aircraft and fall within the prerogatives of the pilot in command. (Enclosure 31)

54. Mission Commander for mishap flight stated the he did not attend the MF brief. (Enclosure 6)

55. OPNAVINST 3710.7S states that before commencing a flight, the pilot in command shall be familiar with all available information appropriate to the intended operation. Such information should include but is not limited to available weather reports and forecasts, NOTAMs, fuel requirements, terminal instrument procedures, and alternatives available if the flight cannot be completed as planned. In addition, the pilot in command and mission commander shall conduct a risk assessment prior to the flight. (Enclosure 31)

56. The MF brief was given by the LSO and all FCLP pilots interviewed stated the following (Enclosures 3,6,21,23,24):

a. Forecast and current weather were not briefed.

b. NOTAMs were not covered for NAS Lemoore or any possible divert fields.

c. Divert fields were not specifically addressed. Flight members assumed NAWS China Lake would be open when if fact it was closed the night of the mishap.

d. MDA's and DH's were not covered for any of the approaches that were to be utilized.

e. Weather minimums for each of the available approaches were not covered.

f. The FA-18 has three altitude warning systems; BARO / SRALT / HRALT. Setting for these systems were not covered.

g. Minimum fuel on deck and bingo fuels were not specifically covered.

h. Runway specific lighting was not covered.

i. ORM was not briefed and a risk assessment was not conducted.

j. The FCLP portion of the brief was complete and thorough.

57. The VFA-97 Shore Admin Briefing outline has bullets covering all items above, but does not address ORM. (Enclosure 32)

58. LSO and pilots interviewed stated that the mishap brief was 10-15 minutes long. (Enclosures 3,6,21,23,24)

59. When asked who did the flight planning, the pilot of 305 stated he didn’t believe there was any. (Enclosure 23)

60. While the VFA-97 SOP has a section on Flight Member Standard responsibilities that defines who is responsible for what part of preflight planning (i.e. dash two gets weather and NOTAMs), the CO stated an FCLP mission are individual aircraft working with the LSO and did not apply to the mishap event. (Enclosure 5,18)

61. LSO stated that he did not know the weather or NOTAMs when he left for the LSO shack at the end of the runway (32L). (Enclosure 21)

62. MP stated that she did not know local weather or NOTAMs, or divert weather when she walked to her aircraft. (Enclosure 3)

63. LSO stated that he had given the same brief many times since the squadron had started FCLP. (Enclosure 21)

64. Pilot of 305 stated it was a standard FCLP brief. (Enclosure 23)

65. One squadron pilot stated that seniors were “disdainful of briefs” and there was a “lack of respect for brief sanctity.” (Enclosure 30)

66. CVW-11 Air Wing Commander, who flies with all four FA-18 squadrons, stated that VFA-97 was at the bottom of the air wing in terms of overall quality of flight briefings. He stated that the quality varied to a great extent by who was giving the brief. (Enclosure 33)

67. VFA-97 Training Officer (just checked into VFA-97 after completing a tour as a TOP GUN instructor) stated that the briefs he had observed were lacking preparation and were not as thorough as other fleet squadrons he had been in. (Enclosure 34)

68. CVW-11 LSO stated that VFA-97 did not seem quite up to their sister squadron’s standards. (Enclosure 35)

69. VFA-97 CO stated he was happy with the quality of the flight briefs in the squadron. (Enclosure 5)

IX. <u>Sequence of Events</u>

(The sequence of events is reconstructed using tower and approach control audiotapes as well as debriefings of the pilots and the controllers. The mishap flight take-off and first couple of passes in the FCLP pattern were uneventful and offer no pertinent data to this report. This section will pick-up just prior to the weather change with all four aircraft in the pattern and 313 on final approach. Times listed are GMT and are pulled from the audiotapes. MP is Hawk 304.)

70. Surface observation weather request shows that on the night of the MF visibility went from 1 1/4 miles to 1/4 mile in nine minutes due to fog. (Enclosure 36)

71. 07:01:24 Hawk 313 at three miles (rwy 32L). (Enclosure 37)

72. 07:02:04 Tower passes visibility down to one half mile. Approach passes to each aircraft that their next pass will be a full stop. Positive acknowledgement is received from each aircraft. (Enclosure 37)

73. NASLEMINST 3710.1M states that when night/reduced visibility FCLPs are conducted with an LSO on station, only carrier deck lighting is required unless additional lighting is requested by the pilot/LSO. Runway edge lighting is required for full stop landings. (Enclosure 38)

74. FAA INST 7110.65N states that at night when visibility drops below one mile, the High Intensity Runway Lights (HIRL) must be turned up to step four and the Approach Lighting System (ALS) must be turned up to step three. (Enclosure 39)

75. Both the Tower Supervisor and LSO recall HIRL on, but not the specific setting. LSO stated the ALS was not turned on for any of the approaches to runway 32L. (Enclosure 40)

76. At ½ mile vis, the weather is below minimums for all available published approaches except for PAR to 32R. (Enclosure 26)

77. OPNAVINST 3710.7S states that an instrument approach shall not be commenced if the reported weather is below published minimums for the type of approach being conducted. However, once an approach has been commenced, pilots may, at their discretion, continue the approach to the approved published landing minimums as shown in the appropriate FLIP for the type approach being conducted. (Enclosure 41)

78. 07:02:08 Hawk 313 reports clara (the pilot cannot see the “meatball”, i.e. glide slope information on the Fresnel Lens Optical Landing System for rwy 32L). (Enclosure 37)

79. 07:02:12 Hawk 313 waves off approach for weather (rwy 32L). (Enclosure 37)

80. 07:02:47 LSO calls for taxi lights on. (Enclosure 37)

81. 07:03:04 LSO confirms ½ mile vis with Tower. (Enclosure 37)

82. 07:03:14 LSO requests approach lights turned up. LSO stated in his interview that the ALS never got turned up on runway 32L. (Enclosures 21,37)

83. 07:03:52 Hawk 304 reports two miles (rwy 32L). (Enclosure 37)

84. 07:04:10 Hawk 304 waves off approach for weather (rwy 32L). Hawk 304 reports a fuel state of 4600 lbs. (Enclosure 37)

85. 07:05:20 Tower asks LSO if he wants the lights on any higher. LSO tells tower to crank them up a little bit. (Enclosure 37)

86. 07:05:30 LSO states “That’s good” in response to Tower’s light adjustment. (Enclosure 37)

87. 07:05:33 Hawk 313 requests a PAR to runway 32R due to weather minimums. (Enclosure 37)

88. 07:05:35 Hawk 305 at two miles (rwy 32L). (Enclosure 37)

89. 07:06:38 Hawk 305 touches down (rwy 32L). (Enclosure 37)

90. 07:06:42 LSO asks Hawk 305 where he broke out. Hawk 305 replies; “there’s really not a good breakout, about 250 feet, visibility is really low.” (Enclosure 37)

91. 07:06:56 Hawk 305 tells LSO that without ICLS, it is not even worth giving it a try. He stated he was on the roll and he could hardly see. (Enclosure 37)

92. Pilot of Hawk 305 stated in the interview that that weather was less than 300/1 (ICLS weather mins for 32L w/o ALS). He stated it was the lowest weather visibility he had ever seen and he could barely see to taxi back to the line. Hawk 305 passed the weather back to the SDO and stated he thought everyone would have to divert for weather. (Enclosure 23)

93. 07:07:09 LSO asks the Tower for the status of the PAR radar on runway 32R. (Enclosure 37)

94. 07:07:38 Tower asks the LSO; “We are below minimums and I hear, uh, some of your people, uh, are going to be taking, uh, GCA’s to the right?” LSO replies, “affirmative.” (Enclosure 37)

95. 07:08:33 Hawk 307 calls the ball (rwy 32L). (Enclosure 37)

96. 07:08:57 Approach control reports field now called visibility ¼ mile. (Enclosure 37)

97. Reported weather is now below single-piloted minimums for all available published approaches on 32L or 32R. (Enclosures 26,41)

98. 07:08:58 Hawk 307 touches down (rwy 32L). (Enclosure 37)

99. 07:09:15 LSO reports Hawk 307 is lifting (rwy 32L). (Enclosure 37)

100. Pilot of Hawk 307 (senior department head) stated in interview that he never saw weather develop like it did the night of the mishap. He stated that after touchdown, he had insufficient visibility to safely roll out and elected to take-off and execute a missed approach. He stated the vertical visibility was good (you could look down and see the runway while in the pattern), but the horizontal visibility was very poor. He stated that with approach control in one radio and Tower/LSO in the other, it made it very hard to pass tactical information regarding weather to other members of the flight. He did not pass any weather information to LSO or other pilots airborne. (Enclosure 6)

101. 07:09:16 Tower tells LSO the fuel state of Hawk 313 is 4000 lbs. (Enclosure 37)

102. 07:09:20 LSO tells Tower to take Hawk 313 to a PAR to 32R or he would have to do an emergency fuel bingo (low fuel profile to divert airfield). (Enclosure 37)

103. 07:09:27 Tower informs LSO that all airborne aircraft were being vectored to approaches for runway 32R. (Enclosure 37)

104. 07:13:02 Hawk 313 at three miles for runway 32R, cleared to land by Tower. (Enclosure 37)

105. 07:14:19 Hawk 313 rolls out on runway 32R. (Enclosure 37)

106. Pilot of Hawk 313 (LCDR) stated in interview that he broke out at 200 feet (AGL) or a little below. He stated it was the worst weather he had ever landed in. He stated forward visibility dropped to zero on touchdown and he would not have been able to safely roll out utilizing runway edge lighting alone. He turned on his taxi light and was able to pick-up the painted centerline stripe that facilitated a safe rollout. He did not pass

this information to other members in flight due to the briefed radio set-up. (Enclosure 24)

107. 07:15:07 Hawk 304 at three miles for runway 32R (Enclosure 37)

108. 07:16:04 Hawk 304 on course, on glide path, at decision height. (Enclosure 37)

109. 07:16:14 Hawk 304 over landing threshold, slightly right of course. (Enclosure 37).

110. MP stated that the PAR approach was “pretty good.” MP stated that she did not know runway 32R did not have centerline lighting. She also stated that she had never landed on runway 32R without the taxi light on (taxi light was secured due to the fog/weather). MP stated she saw the runway environment at decision height and made the decision to continue the approach. She stated that as she entered the fog vertical visibility was good, but horizontal visibility dropped. She stated that she could see the runway as she touched down, but did not have adequate horizontal visibility. She stated she received a “drifting right” call from approach as she touched down. She stated she immediately saw the yellow arresting gear box marker and then hit the box with her left main landing gear. She stated that the jet skidded across the runway and off the left side. She shut down both engines and evacuated the aircraft. No ejection was attempted. MP felt that she did not make the decision to go around early enough. (Enclosures 3, 42)

111. OPNAVINST 3710.7S states the following regarding precision approaches: “A missed approach shall be executed immediately upon reaching the decision height unless the runway environment is in sight and a safe landing can be made.” It also states: “If runway/approach lights/runway lights are not in sight, execute missed approach.” (Enclosure 41)

112. 07:19:23 Hawk 307 is at two miles (rwy 32R). (Enclosure 37)

113. 07:20:09 Hawk 307 executes climb-out on missed approach for weather (rwy 32R). (Enclosure 37)

114. 07:20:16 Departure asked Tower if the lights are up as bright as they go. Tower replies with affirmative. (Enclosure 37)

115. 07:21:10 Hawk 307 requests a visual approach to runway 14. (Enclosure 37)

116. 07:23:23 Tower clears Hawk 307 to land on runway 14L (opposite end of the mishap runway). (Enclosure 37)

117. Tower personnel are not aware of mishap and assume Hawk 304 has cleared the runway. In fact, the runway is fouled by the mishap. (Enclosures 3,37)

118. Pilot of Hawk 307 stated that he planned on diverting after his missed approach to runway 32R (his fuel state was 4300 lbs), but didn't know where yet. He was told over base radio that Fresno Yosemite International, NAWS China Lake, Edwards AFB, and NAS Fallon were all closed or below weather minimums. He stated that as he flew north on the missed approach, he could see the opposite ends of the runways clearly as visibility was much better to the north. Pilot stated the reported weather was below VFR/circling/IFR minimums and he did not request a contact approach. He was able to keep the runway (14L) in sight the whole approach and safely landed. (Enclosure 6)

119. 07:23:48 All Hawks on deck. (Enclosure 37)

X. Command Climate

120. Everyone interviewed from VFA-97, with the exception of CO/XO, stated that squadron morale was low at the time of the mishap. The following are quotes from the

various interviews that help paint the picture; “not healthy”, “frustrating”, “morale low”, “tired, beat-down”, “no stability”, “at times poor”, “mentally tired”, and “felt pressured”. (Enclosures 3,6,21,22,23,24,34,43)

121. CVW-11 Air Wing Commander stated that VFA-97 morale was low. He stated that it did not seem like the same Ready Room as during Operation Enduring Freedom. He stated that the junior officers did not seem as pumped-up or happy-go-lucky as they were in the past. (Enclosure 33)

122. CSFWP (Commodore) stated morale seemed down since last change of command. There was a lot of micro managing. (Enclosure 44)

123. Both CVW-11 LSOs stated that they thought VFA-97 morale was low and the junior officers seemed “beat-down, oppressed”. (Enclosure 35)

124. VFA-97 XO stated that morale was down and he characterized it as moderate/low. (Enclosure 45)

125. VFA-97 CO stated that he thought squadron morale was average with the rest of the air wing considering the circumstances of their tough schedule. (Enclosure 5)

126. All pilots interviewed stated that junior officer tactical progression was slow. Junior officers stated that they did not advance in their tactical qualifications as rapidly as their peers. Many stated this as a source of frustration. (Enclosures 21,23,30,34,43)

127. At the time of the mishap, VFA-97 had eleven first tour FA-18 pilots. None of them were qualified Level IV (Division Leads) and only two were qualified Level III (Section Leads). (Enclosure 46)

128. Several VFA-97 junior pilots interviewed stated that the squadron ranked last tactically out of the four fighter squadrons in CVW-11. (Enclosures 34,43)

129. VFA-97 CO stated the squadron was not as good tactically as they were last year. (Enclosure 5)

130. Squadron SFWTI (Training Officer) stated the junior officers were not being empowered to become tactical. (Enclosure 34)

131. CSFWP (Commodore) comments on his perceptions toward VFA-97: "VFA-97 is in its own box", "different atmosphere", "they march to the beat of their own drummer." (Enclosure 44)

132. Weapons School CO stated that VFA-97 seemed to be the "black sheep" of the air wing. (Enclosure 47)

133. VFA-97 CO stated that he was aware of the perception that VFA-97 does things differently from other squadrons. (Enclosure 5)

134. During squadron Strike Fighter Advanced Readiness Program (SFARP), VFA-97 Operations Officer refused to sign the flight schedule for a period of three days. He stated that CO made so many changes to the flight schedule it was impossible for him to execute a training plan. (Enclosures 16,43)

XI. Risk Mitigation

135. OPNAVINST 3710.7S states that operational readiness and aviation safety are enhanced by assuring that flight and other support personnel achieve and maintain an optimal state of physical and emotional health. Conditions which reduce that state can decrease performance and increase mishap potential. (Enclosure 47)

136. OPNAVINST 3710.7S also states that numerous complex factors affect the readiness of flight and support personnel. Those factors must be understood by all concerned and appropriate countermeasures established to assure they do not reduce personnel readiness. (Enclosure 47)

137. CNAP MSG 191006Z JUL 01 states that Commanding Officers should establish vibrant unit-level ORM training programs. (Enclosure 48)

138. CAG stated that CVW-11's inter-deployment schedule changed several times due to real-world events. The end result had them prepared to deploy five months earlier than originally expected. CVW-11 COMPTUEX and JTFEX were combined, accelerated, and reduced. (Enclosure 33)

139. CVW-11 squadron composition changed from their last deployment with the transition/addition of two new Super Hornet squadrons and reduction in the size of their S-3 squadron. (Enclosure 33)

140. CAG stated that everyone knew there was increased risk associated with the new schedule/composition. (Enclosure 33)

141. While CAG stated that he did not pass anything up the chain of command specifically regarding the risk involved with the new schedule/composition, he did recommended JTFEX be cut out of their turnaround cycle to provide a break in the operational tempo. His idea was rejected. (Enclosure 33)

142. CAG stated that they conducted the Strike Leader Attack Training Syllabus (SLATS) at NAS Lemoore vice NAS Fallon to reduce PERSTEMPO stress. (Enclosure 33)

143. CAG stated that he did not require COs to provide him a risk management plan relating to the accelerated schedule nor did he pass written guidance regarding risk tolerance. He did provide verbal guidance on several occasions on specific events. (Enclosure 33)

144. CAG stated that while he did direct each squadron to conduct a post-holiday safety stand-down, he did not want to tell COs how to run their squadrons. (Enclosure 33)

145. CVW-11 Safety Report states in the last six months, CVW-11 has had nine mishaps (2 Class A, 2 Class B, 5 Class C) and five other incidents worthy of safety reports (inadvertent jettison of IMER, tie down chain not removed before flight, jet ran off runway, EA-6B put into tension with the shot line foul, and top 2/3 of rudder fell off during BFM). (Enclosure 49)

146. CVW-11 mishap rate during last six months is significantly higher than the overall CVW average. (Enclosure 54)

147. CVW-11 Safety reports the following six VFA-97 safety incidents during last 90 days (Enclosure 49):

- CATM-88 departed aircraft on arrestment (class B)
- Aircraft departed runway on landing (class A)
- LATR pod departs aircraft on landing (CODR)
- CATM-7 fin fell off on arrestment (CODR)
- IMER fell off during weapons checks (CODR)
- Top 2/3 of rudder depart aircraft during BFM (HAZREP)

148. NAS Lemoore weather forecaster stated that January is statistically the worst month for Tule fog. (Enclosure 50)

149. CAG stated that they looked at conducting FA-18 FCLPs at NAF El Centro, but the idea was rejected after weighing detachment requirements against PERSTEMPO. (Enclosure 33)

150. CVW-11 SFARP was conducted mid-July to mid-August. (Enclosure 51)

151. The Commanding Officer of Strike Fighter Weapons School Pacific (WSCO) stated that VFA-97 performance during SFARP was well below fleet average and the bottom of the four fighter squadrons in CVW-11. (Enclosure 51)

152. WSCO stated that his OPS O and XO came to him during CVW-11 SFARP with concern over a string of incidents that were beginning to look like links in a mishap chain. Three out of five of the incidents involved VFA-97 flights. (Enclosure 51)

153. WSCO stated that after ORM'ing the situation, they decided to take a day off from flying to regroup and refocus. He discussed the reasons for the shutdown with all the COs. VFA-97 CO wanted to fly unit level training flights instead of taking a day off from flying. He was eventually overruled and all four squadrons took the day off. (Enclosure 51)

154. WSCO stated his perception of VFA-97 included; poor communications flow, department heads telling the CO what he wanted to hear, no accurate assessment from front office on what was occurring in the squadron. (Enclosure 51)

155. WSCO stated that post-SFARP he briefed CAG/DCAG specifically on his concerns regarding VFA-97 safety and tactical performance. He mentioned the lack of communication and his concern about VFA-97 from a safety perspective. He also briefed CAG/DCAG on the stand-down day and how it was brought about primarily due to VFA-97 safety and maintenance considerations. He told them that VFA-97 did not seem to want to participate in the SFARP program. (Enclosure 51)

156. CAG stated that after his conversation with WSCO, he had a one-on-one counseling session with VFA-97 CO regarding the perception that they did not cooperate during SFARP. Conversation was primarily focused on personality concerns vice safety. He recommended but did not direct, that the CO conduct a Safety Survey, Culture Workshop, or Command Safety Assessment. (Enclosure 33)

157. VFA-97 CO stated he had a post-SFARP one-on-one discussion with CAG to talk about personality conflicts during SFARP. He stated safety issues were not discussed. (Enclosure 5)

158. VFA-97 CO stated that he attempted to schedule a Command Culture Survey, but was not able to align schedules in available timeframe. (Enclosure 5)

159. VFA-97 CO stated he conducted several Safety Stand-downs that discussed the schedule changes and additional risks, but did not specifically ORM the changes in CVW-11's deployment schedule. (Enclosure 5)

160. VFA-97 CO stated that the only change made to address their tight turnaround was to reduce the FCLP requirements for the more experienced pilots. (Enclosure 5)

161. VFA-97 took one day off for Thanksgiving, two Sundays (8^{th}/22^{nd}) off, two days off for Christmas (25^{th}/26^{th}), and two days off for New Years (1^{st}/2^{nd}). All other days, including weekends, were workdays or travel days. Three of the work days were half days (24^{th}/29^{th}/31^{st}) and there were two five day leave periods over the holidays. Maintenance was typically working two shifts of twelve hours each to get ready for the upcoming at-sea period. (Enclosure 52)

162. CAG stated that he was aware of VFA-97 working hours and was aware of the low morale. (Enclosure 33)

163. VFA-97 Operations Officer stated that the expectation was for all officers to come to work if Maintenance was working. (Enclosure 16)

164. LSO stated VFA-97 was behind in FCLPs due to weather. (Enclosure 21)

165. SDO on night of mishap stated he felt they probably would have cancelled for weather if they didn't have the upcoming at-sea exercise. He stated the mindset was "to get it done even if it gets worse that night." (Enclosure 22)

166. Pilot of 305 stated that at walk time they knew the field was IMC and weather was deteriorating. (Enclosure 23)

167. All pilots interviewed stated the schedule had been very flexible in the weeks prior to the mishap. (Enclosures 3,21,23,24,43)

168. Several pilots stated there was no stability in the schedule in general and this was a source of frustration. (Enclosure 3,21,23,24,30,43)

169. VFA-97 Operations Officer stated that the schedule was flexible and it was tough to plan your day. Changes were not unusual. (Enclosure 16)

170. All pilots interviewed stated that there was an unspoken pressure to finish FCLPs and get all jets to the boat. (Enclosure 6,21,22,24)

171. VFA-97 Maintenance Officer stated there was mounting pressure to get FCLPs done. He stated it was not overt, but significant. (Enclosure 6)

XII. Damages and Costs

172. Damage and costs estimate are outlined in tables 4 and 5. There was no non-DOD Property Damage. (Enclosure 53)

173. No personnel injuries. (Enclosure 53)

Opinions

I. Causal/Contributing Factors

1. The MP elected to continue an approach into a fog bank where adequate runway visibility did not exist to safely land or rollout. This is in violation of OPNAVINST 3710.7S. The MP admits in the interview that the approach should have been discontinued and a wave-off executed. This would have been a tough decision with the

Table 4: Mishap Aircraft Damage Costs

Aircraft	
Port MLG Assy	54,000.
Port MLG Inboard Door	7,172.
Port Horizontal Stab Assy	25,830.
Port Aileron Assy	41,922.
Port Outboard Flap	15,762.
Port MLG Shock Absorber	31,519.
Engine Intake	205,000.
Engine Damage (2 X 256,308)	512,616.
Center Barrel Assembly	1,340,000.
Aircraft TOTAL COST	2,233,821.

Table 5: DOD Property Damage (Arresting Gear)

DOD Property Damage (Arresting Gear)		
Item	Qty Unit Cost	Total
Bolt	(12 X 37.08)	444.16
Flat Washer	(12 X .30)	3.60
Washer	(12 X 7.35)	88.20
Bolt	(8 X 13.15)	105.20
Nut	(8 X 2.50)	20.00
Pin	(4 X 45.96)	183.84
Screw	(16 X 17.42)	278.72
Plate	(4 X 58.32)	233.28
Screw	(4 X 9.38)	37.52
Plate	(1 X 27.38)	27.38
Bolt	(4 X .93)	3.72
Washer	(6 X .28)	1.68
Bolt	(2 X 1.07)	2.14
Spacer	(4 X 16.70)	66.80
Roller	(1 X 272.16)	272.16
Bearing	(2 X 140.00)	280.00
Shaft	(1 X 136.49)	136.49
O-Ring	(4 X 2.26)	9.04
Fitting Lug	(2 X .20)	0.40
Arresting Gear Sign	(1 X 2145.00)	2145.00
Arresting Gear TOTAL COST	4339.43	

close proximity of the aircraft to touchdown and insidious decline in visibility. The weather conditions on the night of the mishap were especially tough given the fact that all the pilots could see the runways looking down, but horizontal visibility was essentially zero on deck.

Instrument approach minimums are designed to get the pilot safely below the weather. Once a pilot sees the runway at decision height, it is not normal, and the pilot is not mentally prepared to lose sight of it as the approach continues. This is precisely what occurred on the night of the mishap. All the pilots airborne the night of the mishap commented on how this sudden change in visibility surprised them on their approaches. Unfortunately, the weather conditions were never passed from one pilot to the other. (FOF 92,96,106,110,111,118)

2. All pilots flying on the night of the mishap flew approaches with the weather below minimums. Three of the pilots flew approaches to both runways with weather below minimums and the most senior pilot flew an illegal visual approach with the field calling ¼ mile visibility. They all admitted pushing their approaches below legal weather minimums. There seemed to be a mindset that they had to get their aircraft on deck rather than divert. The MP pilot, a [redacted] aviator with the least experience of all the pilots flying that night, was not equipped to operate in this mindset. The pressure for the MP pilot to "hack it", as her squadron mates were apparently doing, cannot be overstated. (FOF 92,96,106,110,118)

3. Had the airfield lighting been set properly, and the ACLS or PAR to runway 32L been functioning, this mishap may have been averted. The past year's NAS Lemoore ACLS data shows system reliability at roughly 30% during peak fog season. Reliability is so poor that the system was not even NOTAMed as unavailable on the night of the mishap. While data could not be found stating an FAA requirement for airfield precision approach system reliability, one could reasonably assume 30% availability for the ACLS system is a little low. (FOF 46,47,48)

4. FAA regulations state the requirements for airfield lighting at night in reduced visibility. The lighting was not set properly on runway 32L on the night of the mishap. The ALS was not turned on as required even after the LSO requested it. Had airfield lighting been turned on promptly and correctly, pilots that waved off approaches to 32L may have been able land without having to transition to 32R. (FOF 42,44,74,75,82)

5. Both RVR systems were down on the night of the mishap. Had both systems been working, valuable time might have been saved in determining which runway had the best visibility and therefore most suitable for landing. (FOF 49)

6. The flight brief was not conducted in accordance with standards established and learned beginning with the first experiences in the training command. Multiple briefing items mandated by instruction were not covered. All pilots were not in attendance. This alone would not have been a safety issue if the pilots and LSO had bothered to get the information they needed prior to walking. Unfortunately, no significant flight planning appears to have been conducted before or after the brief. The forecast weather required a divert field be available. Pilots in the flight assumed standard divert fields would be open, when in fact they were closed. Forecast weather and approach minimums were not known at walk time. This absence of flight planning, especially the lack of an available divert, was likely in the back of each pilot's mind as the weather deteriorated. (FOF 55,56,58,59,61,62)

7. The preponderance of personnel interviewed state that the poor brief given for the mishap flight was not a one-time occurrence, but a systemic problem in VFA-97. The CO did not acknowledge a deficiency in squadron briefing quality.   (FOF 65,66,67,68,69)

8. The operational climate in VFA-97 did not embrace fundamentals of Naval Aviation nor demonstrate adherence to basic operational risk management tenets. This created a

high overall stress level and contributed to degraded performance by the MP and poor decision-making by all pilots in the MF. Squadron morale was extremely low at the time of the mishap. Everyone seemed to recognize this except for the CO. The squadron was operating in a “reactive, crisis action mode,” rather than by using solid long term planning, evidenced by frequent schedule changes and inability to execute a training plan. The result was an extreme negative effect on the squadron’s emotional health. (FOF 120,121,122,123,125 134, 168,169)

9. VFA-97 lacks a robust program to tactically develop their young aviators. As a result, their junior officers are well behind their peers in tactical progression. Squadron SWFTI stated the young pilots were not being empowered to become tactical. This lack of “tactical empowerment” likely contributed to the some of the poor/lack of decision-making on the night of the mishap. (FOF 126,127,130)

10. Ultimately a big factor in this mishap comes down to risk mitigation or lack thereof. If you take a squadron, air wing, or battle group and continue to increase the operational risk level without taking sufficient measures to mitigate risk, the eventual result will be a mishap. It is safe to assume that this mishap would have the highest probability of occurring in the weakest operational link. This mishap involved a below average pilot in a below average squadron. The CO did not take any specific actions to reduce risk in the squadron and does not appear to be embracing a “vibrant unit-level ORM training program.” The result is a string of six safety incidents in the last 90 days including one class A and one class B mishap. (FOF 17,18,19,20,21,68,128,129,147,151)

11. The working hours set by the CO to prepare for the upcoming exercise appear to be excessive. While the squadron took two days off for Christmas and two for New Years, those holidays are hardly conducive to reconstitution and relieving stress. The CO did not appear to recognize the effect command climate and schedule was having on the squadron, and therefore failed to take sufficient action to alleviate risk. (FOF 159,160,161,163)

12. CVW-11 acknowledged the increased risk taken on by the air wing during the current IDTC. A formal risk assessment was not conducted nor required of the squadron CO's. While measures were taken/requested to reduce mitigate risk, the overall air wing mishap rate is extremely high during the last six months. The unspoken pressure of CVW-11's tight IDTC schedule is part of the environment in which the mishap occurred. (FOF 138,139,140, 141,142,143,144,145,146,149)

II. Recommendations for Administrative or Disciplinary Action

1. Administrative/Disciplinary actions are in progress or completed for the Mishap Pilot, Squadron Commanding Officer, and NAS Lemoore Tower Supervisor. Further action will not be addressed in this document.

2. For VFA-97:

a. Review the 3710.7S rules for instrument flying and the importance of not pressing them.

b. Conduct an AOM to hold frank and honest discussion with all officers on what needs to be changed regarding command climate and morale. Do the same for enlisted personnel in a Captain's Call. Report results and changes to CVW-11.

c. Conduct a formal written squadron risk assessment and provide results to CVW-11.

d. Discuss with Top Gun and SFWSP options/ideas to bring squadron SFWT program back on track.

e. Correct flight briefing deficiencies outlined in Findings of Fact 51-69.

3. For NAS Lemoore:

a. Provide all tower personnel additional training on field lighting requirements.

b. Re-emphasize to all tower personnel the importance of following all rules and regulations using this mishap as an example.

c. If feasible, bring the ACLS system up to a reasonable level of reliability and provide adequate support to both RVR systems.

4. For CVW-11:

a. Provide a lessons learned to CNAP to assist next CVW going through an accelerated turnaround.

b. Schedule a meeting for CAG, DCAG, appropriate Battle Group staff, and all squadron CO's to discuss options for mitigating risk during the upcoming deployment. Provide a written report to Battle Group Commander.

P. J. Kind

CHAPTER 3

ANALYSIS

INTRODUCTION

The mishap discussed in Chapter Two was ultimately caused by a combination of human factors. Command climate was assessed to be unsatisfactory and in the end the Commanding Officer was relieved of his command. Could this mishap have been avoided? Perhaps if the leadership had recognized the change in organizational climate and culture, a timely intervention might have been possible avoiding a costly mishap and termination of a promising officer's career. The first step toward prediction and subsequent prevention of these types of accidents is finding a suitable model of human behavior as it pertains to mishap causation. The Navy uses such a model based on the work of Dr. James Reason.

Reason believed the problem of human error could be viewed in two ways: the *person* approach and the *system* approach. Each model generates differing philosophies towards error management. The *person* approach has traditionally been the more widespread view of unsafe acts or errors. This approach tends to focus on individuals at the "tip of the spear," or those who are committing the errors. It provides an easy focus and emphasizes the placing of blame on the individuals committing the error, as if that alone will reduce the problem. It views these unsafe acts as arising primarily from negligence, lack of motivation, inattention, etc. Practitioners of this philosophy place great emphasis on reducing unwanted variability in human behavior. Methods toward reducing errors include adding to procedures, disciplinary measures, retraining, blaming, and shaming (Reason 2000).

The basic tenet in the *system* approach is that humans are fallible and errors are expected, even in top organizations. Origination of errors is seen more as a consequence of systemic problems residing within the organization, than specifically related to human nature. Under this philosophy, one works not to change human behavior or condition, but rather change the conditions under which humans work. A key theme is that of system defenses. When an error occurs, the investigator does not look for an individual who made a mistake, but rather focuses his efforts determining where the defenses broke down. Rather than try and eliminate variability in human behavior, the *system* approach embraces it. As changes occur within the operating environment, this diversity in behavior enables the organization to generate a wide range of ideas to quickly assess and improve its defense structure thereby mitigating risk. In this system diversity is valued and enhances flexibility (Reason 2000).

The Swiss cheese model is a commonly used model in *system* approach accident analysis. Conceptually, the system approach consists of many defensive layers or controls. In Reason's model each of these layers is thought of as a slice of cheese. Ideally the defensive layers would be intact or solid, but in reality there are many holes or openings that represent weaknesses in the layers. These holes arise for two reasons: active failures and latent conditions (failures). The Naval Safety Center has adopted and modified this model in their Human Factors Analysis and Classification System (HFACS) as depicted in figure 3.

Active failures are those unsafe acts or errors that are committed by personnel that are taking part in the actual operation in which the mishap took place. Examples might include the pilot flying the aircraft or the mechanic that performed a faulty repair. Latent conditions or failures are more insidious and indirect. They generally occur as a result of decisions or policy made by higher-level management. Latent failures can negatively impact the operating environment and/or create holes or reduce defenses in individual systems. In order for an accident to occur, the right combination of active and latent conditions must exist within the organization (i.e. the holes within the Swiss cheese must line up as depicted in figure 3).

Under the HFACS model, the key to mishap reduction and prevention is shrinking or eliminating the holes within each defensive layer or slice. For a human behavior model to be useful, it must be able to help prevent future catastrophes. Could the Navy's HFAC model have been useful in preventing the landing mishap discussed? This chapter will apply the HFACS model against this tragedy to determine where the model makes

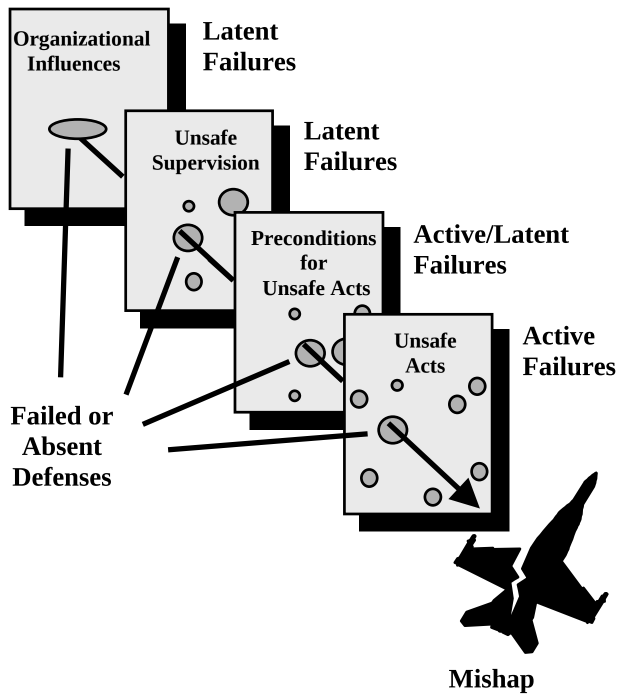

Figure 3. HFACS's Swiss cheese model (Naval Safety Center).

sense and where improvements may be warranted. First we need to have a better understanding of the Navy's model.

The HFACS model for human factor mishap causation divides active and latent conditions into four key layers of defense: Unsafe Acts, Preconditions for Unsafe Acts, Unsafe Supervision, and Organizational Influences. Each will be discussed in detail.

EXAMINATION OF INDIVIDUAL ACTS

Within the Navy Swiss cheese model, the first layer is Unsafe Acts, which as a purely active condition primarily involves the mishap aircrew. Unsafe acts committed by aircrew generally take on two forms, errors and violations. Humans by their very nature commit errors. Violations, on the other hand, tend to be willful disregard for, or breaking of the rules and regulations. They tend to occur less frequently. Not all errors and

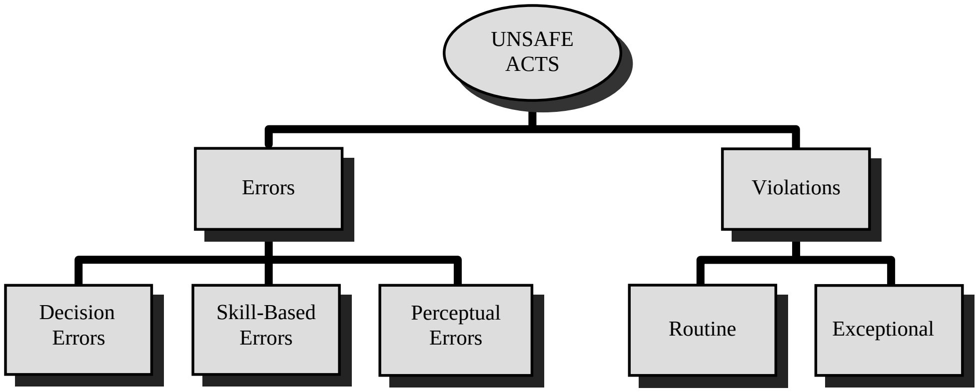

Figure 4. Unsafe Acts Classification (Naval Safety Center).

violations are equal and each is further broken down as shown in the chart displayed in Figure 4.

Basic error forms are described as follows:

1. Decision Errors. They represent intentional behavior that proceeds as intended, yet the plan proves inadequate or inappropriate for the situation. Whether the individual chose poorly or just didn't have sufficient information, a conscious decision was made. These are sometimes referred to as "honest" mistakes and the key differentiation is that the individual made a choice.

2. Skilled-Based Errors. Skill-based behaviors occur without significant conscious thought. They are sometimes described as "stick and rudder" or basic flight skills such as visual scan or checklist habit patterns. Because they are skill-based, they are extremely sensitive to failures of attention or memory. These may be more likely to occur when the individual is heavily tasked or distracted beyond his "comfort zone." An example most people can relate to, is going to the store and then forgetting what you came to buy.

3. <u>Perceptual Errors</u>. Suffice to say, if our perception of reality is not accurate when flying, we are more likely to make mistakes. Perceptual errors usually stem from mistaken or degraded sensory input. There are times when the brain, deprived of sufficient sensory information, will "fill in the gaps" potentially providing false information to the pilot. Examples of perceptual errors include perceiving "false horizons" from weather or terrain during low visibility and the common misinterpretation of light patterns when flying at night.

Violations are the willful departure from authority or regulations not normally tolerated. They are broken into two categories as follows:

1. <u>Routine Violations</u>. Commonly referred to as "bending the rules", these violations are those that are considered habitual or in many cases tolerated. A non-aviation example would include the practice of many individuals who routinely drive 5-10 mph over the posted speed limit. They know it is illegal, yet they will still speed because the authorities will not generally ticket them for the violation. When these types of violations occur, it is imperative to look further up the supervisory chain of command to see if there is tacit condoning of the violation.

2. <u>Exceptional Violations</u>. These are violations that are clearly outside the realm of accepted behavior and not condoned by leadership. Using the speeding example above, an individual driving 50 mph over the posted speed limit is an example of an exceptional violation. It is important to note that while most exceptional violations are heinous, they are not considered exceptional because of this. Rather, they are considered exceptional because they are neither typical of the individual nor condoned by authority.

There were many active mistakes made which contributed to the FA-18 landing accident. These unsafe acts committed are easily classified within the HFACS Unsafe Acts category. Table 6 provides examples of unsafe acts found as casual factors in naval mishaps and highlights those found in our mishap analysis. The mishap pilot made

Table 6: Selected Examples of Unsafe Acts (Naval Safety Center)

(Unsafe acts found applicable to the case study mishap are in bold)

Unsafe Acts	
Errors	**Violations**
Skill-based Errors **Breakdown in Visual Scan** **Delayed Response** Failed to Prioritize Attention **Failed to Recognize Extremis** **Improper Instrument Cross-Check** Inadvertent use of Flight Controls Omitted Step in Procedure Omitted Checklist Item **Poor Technique** Decision Errors Improper Takeoff **Improper Approach/Landing** Improper Procedure Misdiagnosed Emergency Wrong Response to Emergency **Exceeded Ability** **Inappropriate Maneuver** **Poor Decision** Perceptual Errors **Misjudged Distance/Alt/Airspeed** Spatial Disorientation **Visual Illusion**	Routine Violations (Infractions) Failed to Adhere to Brief **Inadequate Brief** **Violation of NATOPS/Regs/SOP** **- Failed to use RADALT** **- Flew an unauthorized appch** - Failed to execute rendezvous - Violated training rules - Failed to adhere to departure procedures - Flew overaggressive maneuver **- Failed to properly prepare for flight** - Failed to comply with NVG SOP Exceptional Violations Briefed Unauthorized Flight Not Current/Qualified for mission Intentionally Exceeded the Limits of the Aircraft **Violation of NATOPS/Regs/SOP** - Continued low-altitude flight in IMC - Failed to ensure compliance with rules - Unauthorized canyon running - Not current for mission - Flat-hatting on takeoff - Briefed and flew unauthorized maneuver

numerous decision, skill-based, and perceptual errors. There were also a surprising number of violations, not just by the mishap pilot, but also by the other pilots in the flight as well as the ODO. The number of errors and violations appears excessive, certainly more than would be expected from a normal FA-18 squadron. Why was this first layer of defense so weak? None of the pilots flying that day had a history of unsafe behavior or rule violation. They had all flown in multiple other squadrons without problems. It would be a stretch to call this group an anomaly or below average. It appears there were other forces at work, reducing the defense barrier of this first layer. We need to move to the next layer and examine the more latent causal factors.

EXAMINATION OF PRECONDITIONS

As we move from the first barrier to the second, we are moving our discussions from active failure points to more latent conditions. While not directly causing an accident, existence of these weaknesses in many cases make the occurrence of the mishap possible. Within the naval model this second barrier is defined as Preconditions for Unsafe Acts. Figure 5 outlines the specific classification structure within this category. There are two major divisions of unsafe aircrew conditions, each with their specific causal categories. They are the Substandard Conditions of Operators and Substandard Practices of Operators. Substandard Conditions of Operators tend to be aero medical in nature and the sub-categories are described in subsequent paragraphs.

1. Adverse Mental States. Mental preparation is critically important in aviation where there is little margin for error or mistake. This category covers mental states that could negatively affect performance. Examples include: mental fatigue, loss of situational awareness, distraction, overconfidence, arrogance, and misplaced motivation.

2. Adverse Physiological States. The second category, adverse physiological states, pertains to medical or physiological conditions that may impact safe operations. Of particular importance to Naval Aviation are conditions such as G-induced loss of

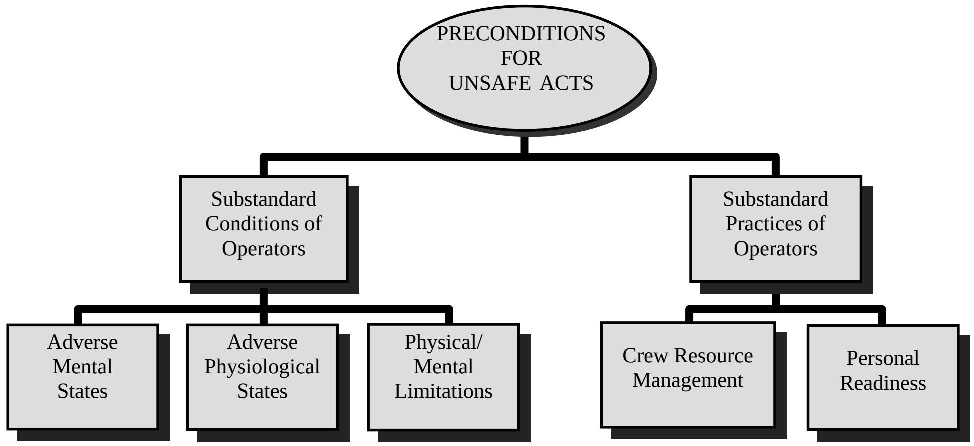

Figure 5. Preconditions for Unsafe Acts Classification (Naval Safety Center).

consciousness, hypoxia, alcohol effects, physical fatigue, medication effects and a myriad of medical conditions known to impact performance. One example might be the pilot flying with a slight head cold. This would likely have an impact on his ability to rapidly climb or descend and would probably have a negative impact on his spatial orientation if flying at night or in instrument conditions.

3. Physical/Mental Limitations. This category refers to those instances when the mission requirements exceed the capabilities of the pilot at the controls. This generally happens for two reasons. First, the pilot may be physically outside the anthropometrical norms and thus have a harder time flying the aircraft properly. He might not be physical strong enough to effectively operate in certain environments (i.e. flying an FA-18 is much harder physically than flying a P-3). The second reason why there might be limitations is due to the external environment. For example; flying on night vision goggles without moon illumination. The mission will not likely change, but the pilot's visual acuity will be markedly decreased.

Substandard Practices of Operators are divided into two categories as follows:

1. Crew Resource Mismanagement. This category includes coordination both within and between aircraft, air traffic control, maintenance personnel, and any other support personnel associated with the flight. It is important to note, especially in light of our single-seat mishap example, that aircrew coordination does not just include the flight portion, but also the planning, coordination, and brief/debrief.

2. Personal Readiness. Personal readiness failures occur when individuals fail to prepare physically or mentally for the flight. Typical examples include self-medicating, consuming alcohol too close to brief time, or overdoing a physical fitness routine. While some of these are violations, they do not occur in the cockpit and therefore are not active failures.

Table 7 displays selected examples of Unsafe Aircrew Conditions with those applicable to our mishap analysis highlighted. What draws immediate attention is that all the failures in our investigation are in two distinct areas, Adverse Mental States and Crew Resource Management.

Due to a change of deployment date, the mishap squadron's turnaround cycle was significantly compressed, putting considerable pressure on reaching readiness goals. Complacency, distraction, mental fatigue, and stress are not unusual within squadrons under high-tempo operations. Could the adverse mental states be a result of the compressed schedule, a possible negative latent condition? There were two other FA-18 squadrons in this air wing under the same pressures as the mishap squadron. Interviews with pilots from these squadrons showed they were not wrestling with the same problems.

The failures in Crew Resource Management are significant and disturbing. Once again this was not just a failure of the mishap pilot, but of everyone involved in the flight. With better leadership, coordination, cooperation, and communication, this accident may have been prevented. Unfortunately, these skills were not encouraged within the squadron (an upstream latent condition). When these pilots, operating in an environment that did not encourage tactical development or leadership, got into a situation which

Table 7: Selected Examples of Preconditions for Unsafe Acts (Naval Safety Center)

(Preconditions found applicable to the case study mishap are in bold)

Preconditions for Unsafe Acts	
Substandard Conditions of Operators	**Substandard Practices of Operators**
Adverse Mental States	Crew Resource Management
Channelized Attention **Complacency** **Distracted** **Mental Fatigue** Get-home-it is Haste **Life Stress** Loss of Situational Awareness Misplaced Motivation Task Saturation	**Failed to Back-up** **Failed to Communicate/ Coordinate** **Failed to Conduct Adequate Brief** **Failed to Use All Available Resources** **Failure of Leadership** Misinterpretation of Traffic Calls Trans-cockpit Authority Gradient
Adverse Physiological States	Personal Readiness
G-Induced Loss of Consciousness Impaired Physiological State Medical Illness Physiological Incapacitation Physical Fatigue	Excessive Physical Training Self-Medicating Violation of Crew Rest Rqmts Violation of Bottle-to-Brief Rqmts
Physical/Mental Limitation	
Insufficient Reaction Time Visual Limitation Incompatible Intelligence/Aptitude Incompatible Physical Capability	

required someone to take charge and make decisions, they responded exactly as would be expected.

EXAMINATION OF SUPERVISION

Many naval mishaps have causal factors related to errors committed within the supervisory chain of command. Our mishap is no exception. Unsafe Supervision represents purely latent failures. Because the supervisory breakdowns are not typically related to the actual mishaps and may preexist for a significant amount of time, their relationship to the mishap is sometimes not intuitive. HFACS divides Unsafe Supervision into four categories outlined in figure 6.

1. Inadequate Supervision. A supervisor, leader, or manger is expected to provide guidance, motivation, appropriate training, and vision to safety execute the organizational mission. He also sets appropriate expectations and provide a role model for those operating within his sphere of influence. Unfortunately, as was the case in our mishap, adequate supervision is not a given within any organization.

2. Planned Inappropriate Operations. An inappropriate operation occurs when the operation tempo and/or schedule are planned such that individuals are put at

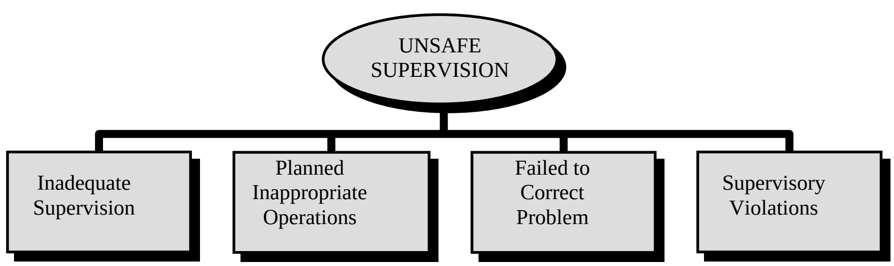

Figure 6. Unsafe Supervision Classification (Naval Safety Center).

unacceptable risk, crew rest is jeopardized, and ultimately performance is adversely affected. Clearly within the military the acceptable level of risk may change depending of deployment requirements and whether it is peacetime or combat operations. An operation could be judged inappropriate if it was outside the normal expectation for a similar unit in comparable circumstances.

3. Failed to Correct a Known Problem. This third category of Unsafe Supervision refers to those instances when the supervisor knows deficiencies among individuals, equipment, training, or other related safety areas, but no action to correct them is taken.

4. Supervisory Violations. This category is reserved for those instances when supervisors managing assets willfully disregard existing rules and regulations.

Table 8 provides examples of each category of Unsafe Supervision. What makes this category harder to apply to our mishap is that the squadron CO did not think there was a problem within his unit. Clearly there was a lack of oversight and in hindsight he permitted inappropriate operations. While there were individual violations of NATOPS, SOP, and regulations on the day of the mishap, it is not clear how chronic this condition was within the squadron.

EXAMINATION OF ORGANIZATIONAL INFLUENCES

The final barrier or "slice" in the HFACS model is Organizational Influences. Decisions of upper-level management directly affect supervisory practices and conditions as well as the actions of individual operators. These influences usually represent the most latent conditions and as such may be in place well before the mishap. These failures occur in areas relating to resource management, climate, or processes as shown in figure 7.

Table 8: Selected Examples of Unsafe Supervision (Naval Safety Center)

(Supervision shortfalls found applicable to the case study mishap are in bold)

Unsafe Supervision	
Inadequate Supervision Failed to Provide Guidance Failed to Provide Operational Doctrine **Failed to Provide Oversight** Failed to Provide Training Failed to Track Qualifications Failed to Track Performance Planned Inappropriate Operations Failed to Provide Correct Data Failed to Provide Adequate Brief Time Improper Manning Mission Not IAW with NATOPS/ Regs/SOP **Permitted Unnecessary Hazard** **Provided Inadequate Opportunity for Rest**	Failed to Correct a Known Problem Failed to Correct Document in Error Failed to Identify an At-Risk Aviator Failed to Initiate Corrective Action Failed to Report Unsafe Tendencies Supervisory Violations Authorized Unnecessary Hazard **Failed to Enforce NATOPS/ Regs/SOP** Failed to Enforce T&R Manual Authorized Unqualified Crew for Flight

Figure 7. Organization Influences Classification (Naval Safety Center).

1. <u>Resources Management</u>. This encompasses management, allocation, and maintenance of all organizational resources including personnel, budgets, equipment and facilities. Typical areas looked at here include manning and training levels, cost-cutting measures, and suitability and upkeep of equipment and spaces.

2. <u>Organizational Climate</u>. In general, organizational climate is the prevailing atmosphere or environment within the organization. It is broken into three sub-categories; structure, policies, and culture. Structure refers to chain-of-command, delegation of authority and responsibility, communication channels, and formal accountability for actions. Policies refer to a course or method of action that steers the decision-making process. Culture refers to unspoken or unofficial rules, values, attitudes, beliefs, and customs of an organization.

3. <u>Organizational Process</u>. This refers to the formal process by which things get done within the organization. Many areas are covered here under sub-categories operations, procedures, and oversight. These include; operational tempos, time pressures, production goals, schedules, procedures and standards, and finally risk management and safety considerations.

The Organization Influences having the greatest impact on our landing mishap were undoubtedly Organizational Climate and Organizational Process as shown in table 9. Weaknesses in the mishap squadron's Operational Processes were magnified when

Table 9: Selected Examples of Organizational Influences (Naval Safety Center)

(Organizational Influences found applicable to the case study mishap are in bold)

Organizational Influences	
<u>Resource Management</u> Human Resources - Selection - Staffing/Manning - Training Monetary/Budget Resources - Excessive cost cutting - Lack of funding Equipment/Facility Resources - Poor design - Purchasing of unsuitable equipment <u>Organizational Climate</u> Structure - Chain-of-command **- Delegation of authority** **- Communication** - Formal accountability for actions Policies - Hiring and firing - Promotion - Drugs and alcohol **Culture** **- Norms and rules** **- Values and beliefs** **- Organizational justice** - Citizen behavior	<u>Organizational Process</u> Operations **- Operational tempo** **- Time pressure** **- Production quotas** - Incentives - Measurement/Appraisal **- Schedules** **- Deficient planning** Procedures - Standards - Clearly defined objectives - Documentation - Instructions Oversight **- Risk Management** **- Safety Programs**

their schedule was accelerated. The constantly changing flight schedule is one example that demonstrated the squadron's inability to formulate a solid plan and then executing it without change.

The investigation also brought to light serious communication problems within the mishap squadron. These along with several comments regarding the "micro-managing" and "toxic environment" are prime examples of the weaknesses within the organizational climate.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Recent years have witnessed a growing interest in the concept of safety culture and safety climate within high-risk industries. They have been defined as follows (Zhang 2002):

1. Safety Culture. The enduring value and priority placed on worker and public safety by everyone in every group at every level of the organization. It refers to the extent to which individuals and groups will commit to personal responsibility for safety; act to preserve, enhance and communicate safety concerns; strive to actively learn, adapt and modify (both individual and organizational) behavior based on lessons learned from mistakes; and be rewarded in a manner consistent with these values.

2. Safety Climate. The temporal state measure of safety culture, subject to commonalities among individual perceptions of the organization. It is therefore situationally based, refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and subject to change depending on the features of the current environment or prevailing conditions.

The HFAC model takes these definitions one-step further and applies them to overall organizational (command) culture and climate. Unfortunately the model does not provide a method to show the impact culture and climate has on every defensive layer within the adopted Swiss cheese model. A poor or dysfunctional command environment does not act purely within its own "slice of cheese" or defensive barrier, but has an insidious effect on every layer. The HFAC model does not fully model this global organizational effect on system defenses. In our mishap investigation, the causal latent failures in every barrier can be traced back to the CO's change of command date. His adverse effect on the squadron climate and culture touched every layer of defense. Even the active failures (Unsafe Acts) to a great extent, can be traced back to the change of command. The complacency, disregard for flight preparation, and drop in tactical performance can all be traced to the CO assuming command. The squadron's poor or dysfunctional culture and climate had essentially increased the size or weaknesses of the holes in the first defensive layer. The supervisory error, while minimal, was legitimate. Supervisory error is not the same as poor command climate as it only acts within a single defensive layer. In a healthy environment the mishap squadron could have functioned safely with a similar level of supervisory failure.

Clearly the Air Wing Commander knew the squadron was having problems and in hindsight, could have provided more assistance. In his defense, the tools available to assist him in recognizing organizational problems and providing help with timely positive intervention were very limited. There is a philosophy within the Navy of "letting CO's be CO's," meaning that as an Air Wing Commander; you would hesitate to intervene unless you were absolutely sure there was a problem. In this case, intervention came too late. Clearly more help is needed to provide our leadership with the confidence for early recognition and assistance in these types of organizational climate/culture problems.

RECOMMENDATIONS

The essential purpose of mishap investigation and creating models of causation is to prevent future accidents from occurring. If we can identify an organization that is at risk early enough, we can step-in and take corrective action to hopefully prevent a negative result. In the mishap we investigated, there were many possible levels of intervention, that had they been made early enough, may have prevented the mishap. Unfortunately, the only significant intervention made was the most drastic (relieving the CO) and it came too late to prevent the loss of an aircraft. Earlier actions may have included; counseling, special training, safety surveys, command intervention teams, and possibly earlier disciplinary action.

The key to timely intervention is identifying organizational problems early. We can take our analysis and create a list of warning signs that point to potential organizational dysfunction. These indicators could be used to help leadership make intervention decisions. These indicators of poor climate/culture are not absolutes, but rather general indicators of potential latent failures.

1. Poor organizational communication. Effective communication is essential for any organization to operate safely. It touches every aspect of an organization and if it is not efficient, it will contribute to culture and climate problems.

2. Slower than normal or arrested professional (tactical) development. Every person desires the opportunity to progress professionally. When they are held back relative to their peers, it has a negative effect on their ability to make decisions and act decisively in the absence of their immediate supervision. Generally speaking, personnel will rise to the level expected of them. If you don't give them responsibility, they won't act responsibly.

3. A sudden decrease in organizational operational performance. There could be many reasons why there might be a decrease in an organization's performance. Once all the other possibilities are eliminated, it is probably a good indicator of a negative culture or climate change.

4. An increase in organizational safety incidents/accidents. In absence of any other obvious explanations, this is another indicator of negative organizational change.

5. A higher than average safety incident/accident rate. This becomes much more ominous if the leadership does not acknowledge there is a problem.

6. Doing things "differently" and then performing below average. Sometimes doing things different from your competitors is a sign of visionary or innovative leadership. However, if there is not a corresponding improvement in operational performance, this then becomes a warning sign of poor leadership and potential latent failures.

7. Below average execution of long term planning. Effective long term planning and execution is essential for an organization's emotional health. Most people do not like to operate in a "crisis-action" or "reactionary" mode for extended periods of time. Failures in planning can easily become latent failures within defensive barriers.

8. Poor morale. People function more effectively and are more productive when they are satisfied. When morale is poor, every weakness within each defensive barrier becomes magnified. Morale is very hard to quantify and every organization has their ups and downs. Yet poor morale is one of the most important indicators of command climate problems. It must be assessed in conjunction with the other indicators.

9. Micro-managing or top-down leadership. Many organizations and managers have been extremely successful with this leadership style. Unfortunately, if it exists in combination with other indicators such as below average performance and poor morale, it is a warning sign of latent organizational problems.

Each of these warning signs was present within VFA-97 in the year preceding their mishap and yet there was no tool in place to help the air wing commander make an intervention decision. Perhaps this list can be used to prevent a similar mishaps from occurring in the future.

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VITA

Commander Peter Kind was born 29 December 1960 in Springfield, IL. He graduated from Waukesha South High School, in Waukesha, WI in 1979. In 1983 he received his Bachelor of Science Degree in Computer Science from the University of Wisconsin – Madison. He entered United States Navy Aviation Officer Candidate School and was commissioned in 1984. He received his Wings and became a Naval Aviator in 1985.

Commander Kind has had tours with VA-42, VA-75, VX-5, CCG-1, VFA-125, VFA-25, VFA-122, CVW-14 and CSFWP. He has 19 years flight experience and has flown in over 15 aircraft models. Commander Kind has received the Distinguished Flying Cross and six Air Medals for aerial achievement. He has over 1000 hours and combat time in each of the following aircraft; A-6, FA-18C, and FA-18E. He is currently the FA-18 Fleet Training Systems Officer for Strike-Fighter Wing Pacific in Lemoore, CA.